

**TABLE 3-3**  
**HVAC Systems of Prototype Buildings<sup>3</sup>**

Use	System #	Remarks
1. Assembly a. Churches (any size) b. $\leq 50,000$ ft <sup>2</sup> or $\leq 3$ floors c. $> 50,000$ ft <sup>2</sup> or $> 3$ floors	1 1 or 3 3	Note 2
2. Health a. Nursing Home (any size) b. $\leq 15,000$ ft <sup>2</sup> c. $> 15,000$ ft <sup>2</sup> and $\leq 50,000$ ft <sup>2</sup> d. $> 50,000$ ft <sup>2</sup>	2 1 4 5	Note 3 Note 3,4
3. Hotel/Motel a. $\leq ((3))$ 6 Stories b. $> ((3))$ 6 Stories	2 6	Note 6 Note 7
4. Light Manufacturing	1 or 3	
5. Office a. $\leq 20,000$ ft <sup>2</sup> b. $> 20,000$ ft <sup>2</sup> and <del>((either))</del> $\leq ((3))$ 7 floors <del>((or <math>\leq 75,000</math> ft<sup>2</sup>))</del> c. $> ((75,000$ ft <sup>2</sup> <del>or <math>&gt; 3</math>))</del> 7 floors	1 4 5	
6. Restaurant	1 or 3	Note 2
7. Retail a. $\leq 50,000$ ft <sup>2</sup> b. $> 50,000$ ft <sup>2</sup>	1 or 3 4 or 5	Note 2 Note 2
8. Schools a. $\leq 75,000$ ft <sup>2</sup> or $\leq 3$ floors b. $> 75,000$ ft <sup>2</sup> or $> 3$ floors	1 3	
9. Warehouse		Note 5

**Footnote to Table 3-3:** The systems and energy types presented in this table are not intended as requirements or recommendations for the proposed design. Floor areas in the table are the total conditioned floor areas for the listed use in the building. The number of floors indicated in the table is the total number of occupied floors for the listed use.

**TABLE 3-3 (Continued)**  
**HVAC System Descriptions for Prototype Buildings<sup>1</sup>**

HVAC Component	System #1	System #2
System Description	Packaged rooftop single zone, one unit per zone	Packaged terminal air conditioner with space heater or heat pump, heating or cooling unit per zone
Fan system		
Design Supply Circulation Rate	Note 10	Note 11
Supply Fan Control	Constant volume	Fan cycles with call for heating or cooling
Return Fan Control	NA	NA
Cooling System	Direct expansion air cooled	Direct expansion air cooled
Heating System	Furnace, heat pump or electric resistance	Heat pump with electric resistance auxiliary or air conditioner with space heater
Remarks	Drybulb economizer per Section 1433, heat recovery if required by Section 1436	No economizer, if not required by Section 1433



**TABLE 3-3 (Continued)**  
**HVAC System Descriptions for Prototype Buildings<sup>1</sup>**

<b>HVAC Component</b>	<b>System #3</b>	<b>System #4</b>
System Description	Air handler per zone with central plant	Packaged rooftop VAV with perimeter reheat and fan-powered terminal units
Fan system Design Supply Circulation Rate	Note 10	Note 10
Supply Fan Control	Constant volume	<u>Variable Air Volume</u> systems with controls per Section 1438 <del>((forward curved centrifugal fan and variable inlet fans))</del>
Return Fan Control	Constant volume	<u>Variable Air Volume</u> systems with controls per Section 1438 <del>((forward curved centrifugal fan and variable inlet fans))</del>
Cooling System	Chilled water (Note 12)	Direct expansion air cooled
Heating System	Hot water (Note 13)	Hot water (Note 13) or electric resistance
Remarks	Drybulb economizer per Section 1433, heat recovery if required by Section 1436	Drybulb economizer per Section 1433. Minimum VAV setting per Section 1435 Exception 1, Supply air reset by zone of greatest cooling demand, heat recovery if required by Section 1436

**TABLE 3-3 (Continued)**  
**HVAC System Descriptions for Prototype Buildings<sup>1</sup>**

<b>HVAC Component</b>	<b>System #5</b>	<b>System #6</b>
System Description	Built-up central VAV with perimeter reheat and fan-powered terminal units	Four-pipe fan coil per zone with central plant
Fan system Design Supply Circulation Rate	Note 10	Note 10
Supply Fan Control	VAV with air-foil centrifugal fan and AC frequency variable speed drive	Fan cycles with call for heating or cooling
Return Fan Control	VAV with air-foil centrifugal fan and AC frequency variable speed drive	NA
Cooling System	Chilled water (Note 12)	Chilled water (Note 12)
Heating System	Hot water (Note 13) or electric resistance	Hot water (Note 13) or electric resistance
Remarks	Drybulb economizer per Section 1433. Minimum VAV setting per Section 1435 Exception 1, Supply air reset by zone of greatest cooling demand, heat recovery if required by Section 1436	No economizer, if not required by Section 1433

**Numbered Footnotes for Table 3-3**  
**HVAC SYSTEM DESCRIPTIONS FOR PROTOTYPE BUILDINGS**

1. The systems and energy types presented in this Table are not intended as requirements or recommendations for the proposed design.
2. For occupancies such as restaurants, assembly and retail that are part of a mixed use building which, according to Table 3-3, includes a central chilled water plant (systems 3, 5, or 6), chilled water system type 3 or 5 shall be used as indicated in the table.
3. Constant volume may be used in zones where pressurization relationships must be maintained by code. Where constant volume is used, the system shall have heat recovery if required by Section 1436. VAV shall be used in all other areas, in accordance with Sections 1432 through 1439.
4. Provide run-around heat recovery systems for all fan systems with a minimum outside air intake greater than 70%. Recovery effectiveness shall be 0.50.
5. If a warehouse is not intended to be mechanically cooled, both the standard and proposed designs shall be calculated assuming no mechanical cooling.
6. The system listed is for guest rooms only. Areas such as public areas and back-of-house areas shall be served by system 4. Other areas such as offices and retail shall be served by systems listed in Table 3-3 for these occupancy types.
7. The system listed is for guest rooms only. Areas such as public areas and back-of-house areas shall be served by system 5. Other areas such as offices and retail shall be served by systems listed in Table 3-3 for these occupancy types.
8. Reserved.
9. Reserved.
10. Design supply air circulation rate shall be based on a supply-air to room-air temperature difference of 20°F. A higher supply-air temperature may be used if required to maintain a minimum circulation rate of 4.5 air changes per hour or 15 cfm per person to each zone served by the system, at design conditions. If return fans are specified, they shall be sized for the supply fan capacity less the required minimum ventilation with outside air, or 75% of the supply fan capacity, whichever is larger. Except where noted, supply and return fans shall be operated continuously during occupied hours.
11. Fan energy when included in the efficiency rating of the unit as defined in Section 1411, need not be modeled explicitly for this system. The fan shall cycle with calls for heating or cooling.
12. Chilled water systems shall be modeled using a reciprocating chiller for systems with total cooling capacities less than 175 tons, and centrifugal chillers for systems with cooling capacities of 175 tons or greater. For systems with cooling capacities of 600 tons or more, the standard design energy consumption shall be calculated using two centrifugal chillers, lead/lag controlled. Chilled water shall be assumed to be controlled at a constant 44°F. Chiller water pumps shall be sized using a 12°F temperature rise, from 44°F to 56°F, operating at 65% combined impeller and motor efficiency. Condenser water pumps shall be sized using a 10°F temperature rise, operating at 60% combined impeller and motor efficiency. The cooling tower shall be an open circuit, centrifugal blower type sized for the larger of 85°F leaving water temperature or 10°F approach to design wetbulb temperature. The tower shall be controlled to provide a 65°F leaving water temperature whenever weather conditions permit, floating up to design leaving water temperatures at design conditions. Chilled water supply temperature shall be reset in accordance with Section 1432.2.2.
13. Hot water system shall include a natural draft fossil fuel or electric boiler. The hot water pump shall be sized based on a 30°F temperature drop, from 180°F to 150°F, operating at a combined impeller and motor efficiency of 60%. Hot water supply temperature shall be reset in accordance with Section 1432.2.2.